POPULAR Computing WEEKLY

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30p

Computer concerto

Reviews: Mission of the Deep

Vic-20 printer

Inside the Spectrum

Function keys on Vic-20

POPULAR Computing WEEKLY

The Team

Editor
Duncan Scot

Reporter
David Kelly [01-930 3271]

Sub-editor
Peter Harvey

Designer
Eric Robble

Editorial Secretary
Fiona McCormick

Advertisement Manager
David Lake [01-839 2846]

Advertisement Executive
Peter Chandler [01-839 1881]

Software Editor
Peter Gerrard [01-839 1855]

Publishing Director
Nick Hampshire

Popular Computing Weekly Hobhouse Court, 19 Whitcomb Street London WC2 Telephone **01-839 6835**

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How to submit articles
Articles which are submitted for publication should not be more than 1000 words long

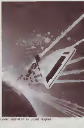
All submissions should be typed and a double space should be left between each line

Programs should whenever possible be computer printed

At present we cannot guarantee to return every submitted article so please keep a copy

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish although we will always try our best to make sure programs work

This Week



Cover illustration by Stuart Hughes

Editorial

Why are so many of the games submitted to this magazine so blood-thirsty?

In the past couple of weeks there has been a great upsurge of programs with titles such as Falklands or Island Invasion

It is understandable that the themes of so many programs should reflect national events

These are still early days in home computing and most of us are still finding our way around our machines

So we choose themes which are close to hand

But we must look to the future

Once we have all become more computer literate we will be able to reflect a greater imagination in our programs

It will not be enough to be good at moving graphic blobs around the screen in fast moving chaotic patterns

Programmers will have to know how to motivate the user, will have to understand how to play on the users emotions, how to captivate the users' imaginations and hold them

Blood-thirsty programs are an easy way out Together we can raise the standard

Next Week



Can you survive the Black Hole? The direst doom looms on next week's event horizon We dare you to be there

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NewBrain debuts at less than £200

Grundy Business Systems have launched the NewBrain, at a basic model price of £199 With an 80 or 40 column display, the system is fully expandable to over 2 megabytes

The NewBrain is based on an original project taken to the National Enterprise Board by Clive Sinclair Newbury Laboratories was given the task of developing it and, finally last year the project was sold to Grundy Business Systems, which has completed its development

There are two models of the NewBrain available, both of which feature a full-size keyboard

The basic Model A is built around the Z80A microprocessor with 32K RAM and 24K ROM on-board It has dual cassette port, tv and monitor ports an expansion port and V24 bi-directional and printer ports

Model AD is the same as Model A but includes an on board blue-green vacuum fluorescent 16 character, 14 segment display

Plug-in memory expansion modules are available for both models with 64K, 128K 256K or 512K of RAM A maximum of four 512K modules may be connected, giving a total memory of over 2 megabytes

Proprietary software packages can be used, loaded via cassette or, under CP/M®, via disc

An important feature of the NewBrain is its size Measuring only 11in × 6in × 2in it takes up little more space than a telephone Even with a 9in monitor, 80 cps printer and 5¼in floppy disc, the unit still only requires 1½ sq ft

Andy Surtees Grundy's Marketing Director, says "The NewBrain is a professional personal computer which, with a full typewriter keyboard, is designed for business, scientific and educational applications, as well as for home use "

NewBrain's compact micro

The NewBrain is scheduled for high-volume production, available in July Model A is £199 Model AD is £229 The 64K and 512K RAM modules are £75 and £445 respectively

More information from Grundy Business Systems Ltd, Somerset Road, Teddington, Middlesex TW11 8TD

The Bee-Box gives Vic extra bytes

The Vic 20 expansion unit, manufactured by B&B Computers of Bolton is now available

John Blackburn, managing director of Beelines Ltd (B&B's marketing company) explained that the unit is a spin-off from B&B's Viewdata developments

The Bee box, as it is called, provides the Vic with extra memory and allows it to download Teletext, Viewdata and Prestel 40 x 25 pages

Inside the Bee-box there are two cards — a 40K RAM board and the B&B VDU display colour-writer board (this is the board that B&B sell for use with the PET)

The 40K comprises maximum 32K Basic RAM with a 2K EPROM operating command system and 6K machine-code-only addressable RAM

The lightweight unit is of the asme dimensions as the Vic and is fitted with a socket to replace the Vic expansion socket which has been used to connect it

The unit sells for £220 plus VAT and has a twelve-month guarantee, from Beelines, Freepost, Bolton BL3 6YZ

Soft-sell on Prestel

Martochoice is trying to get more software on to Prestel following its win in the British Telecom ZX81 Prestel adapter competition

Software manufacturers can sell their programs through Prestel by contacting British Telecom on Freephone 2043

Enquiries concerning the adapter to Martochoice Ltd, 10 Station Close, Jersey Farm, St Albans, Herts AL4 9HT

Putting the boot in

Now that summer is here everybody's mind turns to football Sporting Forecasts who already offers the F4 Football Forecast Program for the Apple, PET, Sharp TRS80 and Video Genie micros intends to produce a version for the BBC micro in time for the 1982-3 season

Further information from Sporting Forecasts, Bureau of Information Science, Commerce House, High Street, Chalfont St Giles, Bucks

The ZX81 interfaces with Epson thanks to Capital

Capital gives ZX81 a choice of printers

Capital Computers has produced a serial/parallel interface for the ZX81, as reported last week

The interface, designed by Mr O Korinek allows the ZX81 to drive most makes of printer, thus providing greater versatility than that offered by Sinclair's own printer

At £39 95, including VAT, the module has both RS232 and Centronics interfaces There is 2K on-board memory and driver routines in a 2716 EPROM. The Sinclair graphics keys can be used with the EPSON printer

The interface is designed to be used with Capital Computers Expansion Motherboard or Mini-expansion board with a maximum 64K available for RAM/ROM addressing

A package comprising, for example, 32K RAM serial/parallel printer interface, cable from interface to printer, and Mini-expansion board, suitable for accounting stock control or word-processing applications, is available for £120

Contact Capital Computers Ltd, 100 Church Street, Luton, Beds

Buzz words from Beebug

Beebug, the Independent National User Group for the BBC micro, has published its first monthly newsletter

Issue One contains 26 pages densely packed with information of interest to both the beginner and the more advanced user There is also a review of the BBC machine outlining special facilities, advantages and limitations

David Graham of Beebug told *Popular Computing Weekly* that the aim was to provide impartial advice and information to BBC owners

"We are just people who have the machines," he said

Beebug now has more than 3,000 members and is keen to have more Membership applications to Beebug Dept 1, 374 Wandsworth Road, London SW8 4TE

Club Reports

Is your club involved in any special projects? Use this page to tell the world about it.

Helping people to get more from machines

***Vernon Gifford** describes how the Amateur Computer Club aids micro users*

Most micro users will have come across the Amateur Computer Club (ACC) at major shows where members co-ordinate club stands. Usually there are about 20 Clubs and User Groups (also Computer Towns) represented at shows with up to 40 machines of many different types in action.

This has become the ideal place to meet other enthusiasts for a wider exchange of views than is possible within individual groups. Prospective buyers find it particularly useful to be able to discuss the merits of computer equipment and software with impartial users who have no commercial bias.

Hundreds of enquirers at ACC's own stand have been put in touch with their nearest local Club or specialist group through the ACC Database — which covers about 250 organisations, and which will shortly be available nationwide on Prestel. These show stands are organised by the very active David Annal, who is also secretary of ACC.

The club was founded in 1972 by Mike Lord, as a newsletter group. Later, with the help of Bob Warren, the group became a club, organising visits and meetings. This led to the formation of other clubs around the country and as these developed, the ACC found itself with a new co-ordinating role to provide background services to the personal computer movement.

This, the oldest computer club in the world, began at a time when there were few micros.

It was only in 1978 that the first computer magazine appeared and so, for five years, the ACC held a unique position.

As the emphasis has switched from hardware and home-brew construction to off-the-shelf micro systems and software, the ACC has had to become more concerned with computer people. Members now require more information for their applications whether in homes, hobbies, recreation or small businesses. Today the main function of a co-ordinating body like the ACC is to link the users to the information.

This has been achieved via *The ACCumulator* edited by Derek and Diana Fordred. It's made great strides and now Basyl Butcher has strengthened the team.

Vernon Gifford takes care of contact with national educational bodies, the BBC, TV and radio, and the computer media.

As the ACC becomes recognised in this new role it is more likely to be consulted as *the* representative body of the large personal computer population.

Club and User Group liaison is another important part of the ACC's programme. This enables groups to share their experiences and leads to national or regional activities in specific areas where individual clubs cannot raise sufficient numbers to justify getting speakers.

A two-way process

To encourage feedback the ACC offers to supply the six copies per year of the newsletter at the base cost of £2.00 to any club appointing a corresponding representative. Many clubs have already taken up the offer.

Various types of associate or group membership are under consideration, and some degree of regional development seems to be desirable. The first experiment — the Association of London Computer Clubs (ALCC) — which ran its third Easter Fair, under the leadership of Robin Bradbeer (who has joined the ACC Committee) has been extremely successful.

As these new activities expanded direct mailshots to clubs have complemented news in the *ACCumulator*.

The ACC supports new groups during their formation, and, if necessary, until such time as they are self-sufficient.

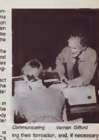
National conferences or workshops are another interesting feature. Last November about 85 people attended a "Micro-Robotics" conference at Imperial College displaying everything from Micro-Mouse to hydraulic mobile robots. A special User Group has been formed.

A second successful conference, on "The Telephone and Your Computer", (Prestel and networks) was organised at Easter by the ACC Chairman, Peter Whittle. This also promises to spawn a special user Group.

Other ACC activities include a technical enquiry service and hardware, software and literature libraries.

Individual membership costs £4.50 for the year, including the six copies of the Newsletter. Facilities are available to negotiate a group membership for a whole club — which has already been taken up by the North London Hobby Computer Club. Their members all receive a copy of *ACCumulator* — to which the Club adds its own newssheet. This reduces the workload of busy club officers and saves duplication of effort.

For further information, contact Rupert Steele (Membership and technical enquiries) St John's College, Oxford, OX1 3JP or Veron Gifford (Liaison and Clubs) 111 Selhurst Road, London, SE25 6LH. Tel: 01-653 3207.


Communicating — Vernon Gifford

Write to Club Reports, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF, with details of successes you have had with your club, with ideas for helping clubs along and with any news of special meetings. We look forward to hearing from you.





Enter the world of sound technology with this simple program which allows you to compose music on a piano-like keyboard

With Computer Concerto you can compose your own music Using the sound generating facility of the Vic-20 the program plays notes at the touch of a key

It displays a representation of a section of the piano Keyboard on the tv screen and produces one-and-a-half octaves of notes, including the sharps and flats

When a selected key is depressed the sound is produced and the particular note chosen is indicated on the display by an asterisk below the relevent piano key

To get the note C, press the C-key and so on The control key gives the sharps and flats and the shift key gives the upper octave

So, for example, when pressing B the shift and control keys together make B# in the upper register

The program

The program itself is quite simple and is most easily understood if it is considered in five parts

1 Lines 100 to 135 print the keyboard display showing the tones and sem-tones CDEFGABCDEF

2 Lines 200 to 245 are the data for producing the notes N gives the frequency data, K gives the key data and KS indicates the shift and control key data

3 Lines 300 to 335 look at the keyboard and compare the values which have been entered with the data in Lines 205 to 225

4 Lines 300 and 305 look at the character keys and the shift and control keys on the keyboard

5 Lines 315 and 330 search through the data for the matching values

When the correct data is located the program jumps out of the search loop to Line 400 Lines 400 to 425 then produce the desired note, N, selected from the data arrays, originally keyed-in as KI and KS

The Vic-20 has three audio oscillators on board and the program pokes a combination of two of them 36874 and 36875, in Lines 400 and 405

In Line 415 the amplitude control, 36876 is poked and the loop in Line 410 then produces a decaying amplitude The combination of locations 36874, 36875 and 36876 produces a warm tone with some persistence, simulating the sound of a piano

Lines 350 to 395 display an asterisk on the screen below the pitch played, so that you can see as well as hear the note

This program is just a start to making music on the Vic-20 It would be quite easy to adapt Computer Concerto in order to vary the lengths of the notes played and to store and retrieve them, making it possible to compose tunes and play them back Such an adaptation would be well worth a try

Whether you are a budding Bach or the next Haircut 100, there should be no stopping you!

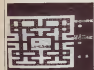
Specially written for *Popular Computing Weekly* by **Nick Hampshire**



Concerto

```
10 SP$="[L:SP=CEL]
100 PRINT "[CLR HOME][CD]
105 PRINT " C D E F G A B C D E F
110 FOR Q=1 TO 5
115 PRINT "| ▒▀ ▒▀ | ▒▀ ▒▀ ▒▀ | ▒▀ ▒
120 NEXT Q
125 FOR Q=1TO5
130 PRINT "    | | ,        |      '
135 NEXT Q
200 DIM N(21),K(21),KS(21)
205 DATA 191,24,0,135,24,2,198,12,0,201,15,2
210 DATA 204,43,0,0,0,0,207,42,0,210,42,2,21
215 DATA 215,19,2,217,17,0,219,17,2,221,55,0
220 DATA 222,24,1,225,34,1,227,18,1,225,18,
225 DATA 220,43,1,0,0,0,231,42,1
230 FOR X=0 TO 20
235 READ A,B,C
240 N(X)=A:K(X)=B:KS(X)=C
245 NEXT X
300 KI=PEEK(203)
305 KS=PEEK(653)
310 FOR X=0 TO 20
315 IF KI=K(X) THEN 330
320 NEXT X
325 GOTO 300
330 IF KS=KS(X) THEN 350
335 GOTO 320
350 PRINT "[HOME,17CD]",
355 PRINT SP$
395 PRINT "[CU] ",RIGHT$(SP$,X) "♦" SP$
400 POKE 36874,N(X)
405 POKE 36875,N(X)
410 FOR Z=15 TO 0 STEP -1
415 POKE 36878,Z
420 FOR W=1 TO 20:NEXT W
425 NEXT Z
430 GOTO 300
```

Reviews
software



Packman

Available from any Commodore dealer
Price £8 95

One of last year s successes in the arcade game world was *Packman* a game in which you had to control a little monster roaming around a maze gobbling up 'dots (and thus gaining points) as he went around

Lives were lost by being eaten by one of the four men rushing around after you three lives was the usual limit, with a bonus life at some point in the scoring

Other features included fruit which would appear from time to time and additional points were to be had by eating these delicacies

There were always four special dots in the corners of the maze Eating these changed the men chasing you from hunters into runners, and you could then eat them as a further method of scoring points

The reason for mentioning all of this is quite simple the success of any reproduction of an arcade game for a small micro depends on how faithful that reproduction is

Packman by Hi-Tech, comes on cassette, and fits quite happily into the standard Vic 20 The rules are not explained anywhere presumably they assume that you know the game from your local pub

All they do tell you is how to control your monster, which proves to be somewhat difficult as the four keys enabling you to move up, down, left, and right are all next to each other and it's very easy to get into quite a tangle

The maze on which the game is enacted does not use the whole Vic screen although the program does use the now common practice of filling the whole of your tv screen Use of graphics and sound is not very good, and the game as a whole is quite slow to respond to your commands

Summary
Some of the features of the original arcade game are missing so all in all it s not one of the best games currently available **PG**

Cassette AB

Cadsoft 24 St James Street, Cheltenham, Glos
Price £5 20

Do you like the stirring informative title of this cassette? It is in fact a double feature containing the five programs each from Cassettes A and B (£3 each) Now you know Know too that Cadsoft also sell cassette Z (four 16K programs for £3) and listings of most of their products

The autndr(s) of the Cassette AB prog rame show a commendable ingenuity in coping with 1K restrictions in pure Basic None of the programs are novel but they all work and are fairly good implementations of standard ideas

Guess the Word is 'similar to hangman with no graphics Well at least you re warned — I ve seen hangman routines without graphics and no warning of it! The trick here is that the user enters the words to guess from a printed list where they are **in code** — so the computer knows what they are, but you don t

There s also *Towers of Brahma* (with five rings to move) versions of a *Mastermind Simon Flyswat Lander Duckshoot* and *Number Square* (3 x 3) and an impressive little *Fruit Machine*

This is all very pedestrian then — but I guess someone has to make 1K ZX81 versions of the standard games Cadsoft s are fairly cheap load without problems and come with good documentation

Summary
A fair-value compilation of nice BASIC versions of standard games **KJ**

Vicmen

Available from any Commodore dealer
Price £8 95

Vicmen, by Bug Byte is a significant improvement. Again available on cassette for the standard Vic it uses the whole of the tv screen for the game and envelops all of the features in the game we know and love It is very well written and is quick to respond to your requests

Two complaints mar what should have been a very good program As in the Hi-Tech game, the keys for moving your man are next to each other making life awkward to say the least Secondly the background music (there is no difference in noises when different events take place in the game) is enough to send you looking for the nearest cliff to jump off depressing is not the word

Summary
If you ve got nimble fingers and a volume control on your set you re in for an enjoyable time with this particular cassette **PG**

Mission Of The Deep

Macronics 26 Spiers Close, Knowle, Solihull West Midlands
Price £5 00

This is one of those awful blind graphics adventure games — I have no other name for the genre As with all adventures you don t know where you are what you re doing or how to do it

In this case the maze is hidden until the end and the fierce crabs jump out at you with little warning and little chance of escape It s addictive for millionaires the unemployed and other persons of leisure!

The program starts rather strangely, with LOADED — PRESS ANY KEY TO RUN (I m not sure what happens if it doesn t load) After that you re straight into deep black water on your own

The accompanying notes do provide some sort of guidance to the three levels of play I ve no doubt that some real addicts would say that these notes are disgracefully over-detailed but in reality they give just about adequate help for those new to such experiences They tell you how to cheat for instance — most unwise

It s not for me to tell you how to get to the bottom — of the program I mean So that doesn t leave much for me to tell you

Personally I prefer Macronics animated graphics games some of which are superb All the same this is as good an example of 'blind graphics adventure as any I ve seen and while the graphics don t come up to Atari standards they ll do

Mission Of The Deep is a Basic program taking up some 13K of RAM It loads easily and is appealing to folk of all ages

Summary
An excellent ZX81 example of the blind graphics adventure genre of computer game No problem if you're into such things **KJ**

Vic 1515 Printer

Available from Commodore dealers
Price £230

Why Commbdore should make the pnce of Vic peripherals such as the 1515 pnnter or the 1540 disc drive consiberably greater (curranrly!) than the pnce of the Vic itself is a mystery best known to themselves However we re stuck with it so what do you get for your £230 when you buy the Vic pnnter?

The printer connects up to the senal port on the Vic and thus as with the Vic disc drive can be daisy chained to other serial bus devices

This is not quite so mad as it might seem as the printer has a switch on the front enabling you to change the device number to be either 4 or 5 Consequently two different pnnters can have two different device numbers and be used for varying functions

The switch also allows you to run the pnnter through a self-diagnostic test which simply pnnts out all the possible characters available from the Vic keyboard

It is a 30 character per second unidirectional pnnter using a five x seven dot matrix Capable of pnnting out all the Vic graphics set you can also have individual dot addressable graphics, although this does tend to wear out the print head rather rapidly

Maximum paper size is 80 columns but unfortunately it takes non standard size tractor feed stationery which is quite difficult to get hold of — surprising in a penpheral for a machine aimed at the consumer market

The quality of the output when in upper case mode is quite good, but switching into lower case produces some odd results

The letter p for instance (there are others) looks very much the same in both upper and lower case thus making readability somewhat difficult As the main function of a printer is to reproduce what would otherwise appear on the screen this is something that Commodore ought to be looking at

There is a routine in the manual to dump the contents of the screen on to the printer a nice touch

There are 12 control codes available on the printer and two secondary addresses for selecting whether you want to be in, cursor up mode or cursor down mode These enable you to pnnt in both upper and lower case at the same time

The control codes give you access to such features as double width characters, reverse field user definable characters and so on

With a pnnt speed of only 30 characters-per second listing but a long program can become particularly tedious It is also an exceedingly noisy pnnter If you ve got a long listing to do go outside make yourself a cup of coffee and let the printer get on with it

Summary
It is an expensive noisy, slow printer but with fairly clear output It does have some redeeming features like the character coding However as it s just about the only printer on the market at the moment you haven t got a lot of choice! **PG**

ZX81 QWERTY Keyboard

Computer Keyboards Glendale Park Fernbank Road, Ascot Berks Tel 03447 5661
Pnce £28 95, assembled version £31 04 case £15

This is not an ordinary ZX81 keyboard with 40 push button keys but a professional QWERTY keyboard converted to work with the ZX81

The QWERTY keyboard is the type seen on a typewriter and this version for the ZX81 also includes a space bar The keys are also laid out in the stepped fashion of a typewriter making the feel of the keys easier to the touch typist

The keys are the same as those found on many other computer terminals and they have a reputation for long life The key tops are covered with clear plastic covers under which can be placed the Sinclair signs and symbols

There are six extra keys (three on each side) which can be wired up as user definable keys like the BBC machine if it has a port attached

The keyboard size is 10 x 4½" x 2" and can either be mounted as supplied (with rubber feet) or in an aluminium case The case can be used to house the ZX81 s printed circuit board and also provided is a metal strap to clamp the Sinclair 16K RAM pack to the case

Connection to the ZX81 is done via a set of plastic stnps which plug into sockets on the keyboard This means that there is no soldering required if you buy the assembled version

The improvement in speed is usually in the range of 50 per cent depending on your typing speed There is a limit on the speed at which keyboard entnes can be made of five characters a second, which is set by the ZX81 If you try to beat it then some entnes will not register in the computer

This keyboard is one of the best I have seen as it allows people who have used a typewnter keyboard before to raise their inputting enormously It can also speed up games to make it easier to beat the computer!

The kit is fairly easy to construct as all keys are in one big block and there is no way you can get them to fit in the wrong way round The ZX81 when mounted inside the case, stabilises the RAM pack beautifully as the pcb is firmly held in the case **SA**

Fun with Microcomputers

By Conald D Spencer
Reward Books, 128 pages paperback
£7 45

This is the sort of book that must sell well to the casual bookshop browser — A4 pages littered with cartoons, plenty of program listings and a colourful cover The price though may be rather off putting (yet this is $9 95 in Amenca where it comes from which typefies the mark-up on books imported across the Atlantic)

When that casual purchaser unwraps the package in the comfort of his/her own home however second impressions are likely to be less appealing

The colourful cover shouts Painless programming for kids and adults — no expenence required! The games puzzles and problems in this book introduce you to programming with BASIC quickly

There are two ways to learn programming — with understanding and without it. Both may be painful or painless fun or drag In essence this book a revamped issue of one called *Fun With Computers And BASIC* (1977) does not go too much for understanding nor is using it a festival of fun

Spencer starts off with a few chapters of theory His language is casual but not straightforward His facts are not all beyond dispute For example A semiconductor is an extremely small electronic component such as a transistor or a diode These components act as on off switches

Then there is an introduction to BASIC programming — in eighteen pages Not bad but, as I say not concerned overly with understanding

The rest of the material is listings and programming tasks There are 62 of these, a few being novel Few listings take up more than about a page they are in non-graphics terminal-style Basic and tend to be mathematically biased

I wouldn t recommend anyone to buy this book All the same you may get some program ideas from it — induce your local library to get a copy

Summary
This little book does not fulfil its initial promise It is rather superficial and out of date but contains a few useful listings **KJ**

Open Forum

Open Forum is for you to publish your programs and ideas
It is important that your programs are bug free before you send them in We cannot test all of them
Contributions should be sent to Popular Computing Weekly, Hobbouse Court, 19 Whitcomb Street, London WC2H 7HF

Print using routine

on ZX81

The ZX81 Basic lacks a PRINT USING instruction The PRINT USING instruction is particularly useful for tabulating a list of mixed alphanumerical data, when the numbers have to have the decimal points lined up in columns It is also useful to be able to specify the number of decimal places to be printed, regardless of the precision of the number

The listing shown in figure 1 contains a PRINT USING routine in lines 7000 to 9570

Lines 30 to 470 explain how to use the routine, and lines 1000 to 1400 contain a demonstration program to show the routine in use Figure 2 shows the output from a run of this program — the data is quite arbitrary

In order to use the PRINT USING routine you must first specify the format required

This is done by setting up Z$ to the desired format Z$ represents a line across the screen and thus should not normally be more than 32 characters in length "$" is used to indicate where literal strings are to be printed and "*" is used to indicate where numbers are required

The position of the decimal point (if any) is indicated by a "." The number of places of decimals to be printed is controlled by the number of "*" after the "." For example values from −8 00 to 99 99 are allowed by ** ** Outside this range (ie the range specified by the number of * in Z$) error 6 will result

Any characters in Z$ other than $ or * will be printed as they stand in the positions occupied in Z$

Secondly you must assign the data to be printed to the string Y$ Each item of data must match that expected in Z$ and should be separated by a comma (,) Numbers or numerical variables should be assigned using the STR$ function and all data should be linked together using the "+" Y$ must end with a comma

For an example see lines 1310 and 1340 and 1340-1360 in figure 1

Lastly, to print a line of data, call the routine at line 7030, ie GOSUB 7030

The program routine uses the following variables

FNO — factor to generate the required number of decimal places

DECPNT — points to the decimal point in X$

DP — points to the decimal point in Z$

PLACES — number of decimal places to be printed

X$ a string to hold number to be printed

Y$ — a string to hold data

Z$ — a string specifying the format
- $ for literal
- * for numbers
- . for decimal point

anything else is printed unchanged

Lines 7030-7070 scan Z$, character by character for $ or *

Line 7040 detects the start of a string Strings are left justified The routine at line 8000 to 8270 is called to print the string, padding out or truncating as necessary to the exact number of $ or Z$

Line 7050 detects where the start of a number is to be printed The routine at lines 9000-9570 is called to print the number If the width of the field Z$ is inadequate, error 6 will result

Line 7060 will print the character in Z$ if it is neither a $ nor a *.

Line 7080 will cause the next call to the routine to start a fresh line.

String handling routine

Line 8030 sets Y to point to the first character of Y$

Lines 8040-8050 print a character and increments Y to point to the next character

Lines 8050-8080 check whether another character is to be printed ($ in Z$). If the end of Z$ is reached, or if there is no $, printing will stop and control will pass to line 8140 to truncate the string

Line 8090 checks whether the string in Y$ is shorter than the space allowed, and if so jumps to line 8170 to 'pad' out the field with spaces

Truncate

Lines 8140-8160 scan for the end of the string in Y$ (indicated by the ,). Thereby truncating the string

Line 9170 discards from Y$ the item of data, so that the next item of data is at the start of Y$

Pad out

Line 8220 discards from Y$ the item of data, so that the next item of data is at the start of Y$

Lines 8230-8260 pad out the field with spaces until Z$ runs out of $ or the end of Z$ is reached

Number handling routine.

Line 9030 sets Y to point to the first character of Y$

Line 9040 sets Y$ to a NULL string

Line 9050 checks whether the first character is a " " (for value less than 1)

Lines 9060-9090 assign X$ to the number up to the decimal point

Line 9100 saves the position of the decimal point

Lines 9110-9140 assign the remainder of the number

Line 9150 discards from Y$ the data item so that the next item to be processed is at the start of Y$

Lines 9160-9200 find the position of the decimal point in Z$

Line 9210 checks whether the field is large enough for printing

Lines 9220-23 and **9540-9570** find the number of decimal places

Line 9240 calculates the multiplying factor FNO

Line 9250 prints the number in the required position ie aligns the decimal points and prints the required number of decimal places

Line 9260 sets Z to point to the next character in Z$

Graphics

on BBC Micro

Here are four programs to show the BBC Micro graphics in operation The first one selects elements of the string A$ (defined in line 50) to produce a balanced, evolving pattern

The second program, *Coloured Lace*, is based on the first one, but it uses a string of full stops and spaces, producing quite a different result

The third program *Tesseract* based on a program by Alastair Gourlay uses the string defined in line 70 in an unexpected way to produce more balanced patterns From time to

Print using routine

By Roy Eastwood

```
10 REM PRINT USING ROUTINE ©
20 REM ROY EASTWOOD   MARCH 19
82
30 REM
40 REM TO USE THE ROUTINE  SET
50 REM UP THE STRING Z$
60 REM TO THE DESIRED
70 REM FORMAT   USE $ FOR
80 REM LITERAL STRINGS  AND #
90 REM FOR NUMBERS  USE # .
100 REM TO INDICATE WHERE THE
110 REM DECIMAL POINT IS TO BE
120 REM PRINTED  THE NUMBER
130 REM OF PLACES PRINTED AFTER
140 REM THE DECIMAL POINT WILL
150 REM BE LIMITED BY THE
160 REM NUMBER OF # IN Z$
170 REM FOR EXAMPLE  ##.##
180 REM   WILL GIVE 2 DECIMAL
190 REM   PLACES AND WILL CATER
200 REM   FOR VALUES UP TO
210 REM   99.99.
220 REM
230 REM THE DATA SHOULD BE
240 REM ASSIGNED TO A STRING
250 REM Y$   BOTH LITERAL AND
260 REM NUMERICAL DATA SHOULD
270 REM BE ASSIGNED AND EACH
280 REM DATA ITEM SEPARATED BY
290 REM A COMMA  Y$ MUST END
300 REM WITH A COMMA  USE THE
310 REM STR$ FOR NUMERICAL DATA
320 REM AND CONCATENATE ALL
330 REM ITEMS USING THE + .
340 REM
350 REM FOR EXAMPLE  TO PRINT
360 REM  A$  A AND THE CONSTANT
370 REM  87.4  USE
380 REM
390 REM  LET Y$=A$+   +STR$ A+
 +STR$ 87.4+
400 REM
410 REM  FOLLOWED BY
420 REM          GOSUB 7030
430 REM
440 REM THERE FOLLOWS A SAMPLE
450 REM RUN. THE ROUTINE PROPER
460 REM STARTS AT LINE 7000
470 REM
1000 REM SAMPLE RUN
1010 REM
1020 DIM A$(20 15)
1030 DIM R(20)
1040 DIM B(20)
1050 LET A$(1)= ASPARAGUS
1060 LET A$(2)= ARTICHOKE
1070 LET A$(3)= BREAD
1080 LET A$(4)= BUTTER
1090 LET A$(5)= CHEESE
1100 LET A$(6)= CUCUMBER
1110 LET A$(7)= EGGS
1120 LET A$(8)= FISH
1130 LET A$(9)= GHERKINS
1140 LET A$(10)= HARICOT
1150 LET A$(11)= ICE CREAM
1160 LET A$(12)= JAM
1170 LET A$(13)= LETTUCE
1180 LET A$(14)= MUSTARD
1190 LET A$(15)= NUTS
1200 LET A$(16)= ORANGES
1210 LET A$(17)= PORK
1220 LET A$(18)= QUINCES
1230 LET A$(19)= RABBIT
1240 LET A$(20)= SALT
1250 LET Z$= $$$$            $$$$$
 $$$    $$$$
1260 LET Y$= ITEM PRICE QTY COST
1270 GOSUB 7030
1280 LET Z$= $$$$$$$$$$     # ##
 ###   ###.##
1300 PRINT
1305 FOR N=1 TO 20
1310 LET Y$=A$(N)+
1320 LET R(N)=INT (RND*300)/100
1330 LET B(N)=INT (RND*1000)
1340 LET Y$=Y$+STR$ R(N)+
1350 LET Y$=Y$+STR$ B(N)+
1360 LET Y$=Y$+STR$ (INT ((R(N)*
B(N))*100) 100)+
1370 GOSUB 7030
1380 NEXT N
1390 STOP
1400 REM
7000 REM [illegible]
7010 REM [illegible]
7020 REM [illegible]
7030 FOR Z=1 TO LEN Z$
7040 IF Z$(Z)=$ THEN GOSUB 80[illegible]
0
7050 IF Z$(Z)=# THEN GOSUB 90[illegible]
0
7060 IF Z$(Z)<>#" AND Z$(Z)<>$
 THEN PRINT Z$(Z);
7070 NEXT Z
7080 PRINT
7090 RETURN
8000 REM [illegible]
8010 REM [illegible]
8020 REM [illegible]
8030 LET Y=1
8040 PRINT Y$(
8050 LET Y=Y+1
8060 IF Z>=LEN Z$ THEN GOTO 8140
8070 LET Z=Z+1
8080 IF Z$(Z)<>$ THEN GOTO 814
0
8090 IF Y$(Y)=   THEN GOTO 8000
8100 GOTO 8040
8110 REM
8120 REM [illegible]TRUNCATE STRING[illegible]
8130 REM
8140 IF Y$(  <=   THEN GOTO 8170
8150 LET Y=Y+1
8160 GOTO 8140
8170 IF Y+1<LEN $ THEN LET Y$=Y
$(Y+1 TO )
8180 RETURN
8190 REM
8200 REM [illegible]PAD WITH SPACES[illegible]
8210 REM
8220 IF Y+1 LEN Y$ THEN LET Y$=Y
$(Y+1 TO )
8230 PRINT
8240 IF Z>=LEN Z$ THEN RETURN
8250 LET Z=Z+1
8260 IF Z$ (  $ THEN GOTO 8230
8270 RETURN
9000 REM [illegible]
9010 REM [illegible]
9020 REM [illegible]
9030 LET Y=1
9040 LET X$=
9050 IF Y$(1)= . THEN GOTO 9100
9060 LET X$=X$+Y$(Y)
9070 LET Y=Y+1
9080 IF Y$(Y)=    OR Y$(Y)= ,  T
HEN GOTO 9100
9090 GOTO 9060
9100 LET DECPNT=Y-1
9110 IF Y$(Y)="  THEN GOTO 9150
9120 LET X$=X$+Y$(Y)
9130 LET Y=Y+1
9140 GOTO 9110
9150 IF Y+1<LEN Y$ THEN LET Y$=Y
$(Y+1 TO )
9160 LET DP=1
9170 IF Z+DP>LEN Z$ THEN GOTO 92
10
9180 IF Z$(Z+DP)<> # THEN GOTO
9210
9190 LET DP=DP+1
9200 GOTO 9170
9210 IF DECPNT>DP THEN LET Y=Y/0
9220 LET PLACES=1
9230 IF Z$(Z+DP)= . THEN GOSUB
9540
9240 LET FNO=10**(PLACES-1)
9250 PRINT TAB (Z+DP-DECPNT-3) I
NT (VAL X$*FNO+.5)/FNO
9260 LET Z=Z+DP+PLACES-1
9270 RETURN
9500 REM
9510 REM [illegible]RTNE TO COUNT DECIMAL
9520 REM [illegible]PLACES
9530 REM
9540 IF Z+DP+PLACES>LEN Z$ THEN
RETURN
9550 IF Z$(Z+DP+PLACES)<> # THE
N RETURN
9560 LET PLACES=PLACES+1
9570 GOTO 9540
```

Graphics

By Tim Hartnell

```
[illegible]
```

```
[illegible]
```

```
[illegible]
```

```
[illegible]
```

time this program will clear the screen (see line 240) to start all over again

The fourth program, *Solids*, is based on a routine which originally plotted an oval in Mode 4. The program chooses the centre point of the oval, and its height and width randomly, then plots the oval around this, using a random step size (see line 120) based on the number produced in line 110

Lines 70 and 80 determine whether or not the plotted shape will be moved slightly up, down, left or right before being re-plotted

The resultant shape, which varies every time you run the program, resembles a solid figure which explains the title

An average peek

on ZX81

The ZX81 manual explains how to find what byte is at a given ROM address, and these values vary between 0 and 255. It is of interest to know what the average ROM byte value is, and what is the total numerical value of all the bytes, up to a given address

This can be rapidly calculated by the following program (for 1K RAM). To avoid the program 'blowing up' at the address 0, the average peek value in the ROM is defined as

$$\text{average} = \frac{\text{TOTAL bytes}}{\text{ROM address} + 1}$$

```
 5 REM PEEK AVERAGING FOR ROM
10 PRINT "ADDRESS"; TAB 8; "BYTE"; TAB 14;
   "TOTAL"; TAB 20; "MEAN"
20 LET TOTAL = 0
30 FOR A = 0 TO 200 STEP 1
40 LET TOTAL = TOTAL + PEEK A
50 PRINT A; TAB 8; PEEK A; TAB 14; TOTAL;
   TAB 20; TOTAL/(A + 1)
60 NEXT A
```

An Average Peek
By Rey H. S. Sluston

The results are displayed in four columns with the headings ADDRESS, BYTE, TOTAL and MEAN. By varying the upper limit on line 30, as many results as required can be displayed and also the STEP length can be varied as required

It was found that for address numbers up to 200 the average byte value varies between 110 and 126. The program fits well inside the ZX81 1K RAM and the running time will depend on the upper limit in line 30 and the STEP value

Open Forum

Spacefighter

on Vic-20

As this program utilises user-defined graphics, it will only work with the unexpanded Vic. The main aim of the game is to destroy as many enemy fighter ships as possible in 100 seconds.

The enemy ships appear from the mother ship at the top of the screen. The player aligns the sights on an enemy target and fires.

The sights can be moved in all four directions and once you move the sight cursor it will continue to move until you release the key.

When the program is run, it first asks you whether you want instructions or not (Lines 12000 to 12240).

While you are reading the instructions the computer designs the hi-resolution characters and copies the alphabet into RAM.

When this has been completed the RAM character generator is activated by Line 35. After this is finished the computer draws the alien mother ship and fighters and Lines 85 to 2090 make the fighters move down the screen and also draws the sights.

Lines 4000 to 4930 carry out the firing sequence and also see if you have hit your target. If you hit your target head-on the computer plays a chaotic tune and awards you 10 points (Lines 8590 to 8700).

If you only strike the alien craft a glancing blow the computer only makes an explosion noise and awards you 5 points.

If you wish to use a joystick then you must adjust Lines 2010 to 2058.

Flash counting

on ZX81

The object of this program is to train the user in 'flash counting' counting groups at a glance without breaking them down into single items.

The program displays a random number of black squares in the top half of the screen in a random pattern. After a few moments these are removed and the user is invited to estimate how many squares were displayed.

After each attempt the computer gives the correct number and after 10

Spacefighter
By S Mahmood

```
[illegible]
2050 POKE36878,200
2060 P=P+F
[illegible]
2090 GOTO 90
[illegible]
```

```
[illegible]
```

```
200 LET P= .
210 LET S=
220 LET R=10
230 LET S=R-R
240 LET X=R<>R
250 LET Y=X
260 LET Z=R*R
270 FOR M=S TO R
280 LET N=R<>R
290 FAST
300 FOR I=P TO 40+Z*RND
310 LET U=RND
320 PRINT " " AND U>=R ; "■" AND U<R
330 IF U<R THEN LET N=N+S
340 NEXT I
350 SLOW
360 FOR I=R<>R TO Z
370 NEXT I
380 CLS
390 INPUT E
400 PRINT E ,N
410 FOR I=R<>R TO Z
420 NEXT I
430 LET X=X+N
440 LET Y=Y+ABS (N-E)
450 CLS
460 NEXT M
470 PRINT "SUCCESS RATE ";(1-Y/X)*Z;" PER CENT"
```

Flash counting
By Dave Lawrence

attempts a success rating is then displayed

The main interest of the program is not in its originality but in the simple way that it does, in one context at least, help you change the way you count and become more open to those flashes of intuition that turn out to have a high degree of accuracy

Beginners should be looking for a score of somewhere around the 80 per cent mark, but for more practised users an average of 95 per cent is achievable

Program notes

Line 200. This value is used later to determine the frequency with which squares are printed A higher value will result, on average, in more squares and vice-versa

Line 230. This line and the three following save space by avoiding the use of literal numbers

Line 300. There is nothing particularly significant about the maximum value of the loop, simply that if the full 290 print positions are used it is about the maximum display obtainable before the memory is full

Line 320. On a 1K ZX81 it is always important to remember that print statements can be associated logically on the same program line Here, the conditions associated with each print statement ensure that *either* a space is printed *or* a black square

Line 330. N is the number in a particular group

Line 430. X is the total number in all groups

Line 440. Y is the total error, either way

Pie chart

on ZX81

This program will draw a pie chart from any data you care to give it. First ask for a title. This must be a maximum of 20 characters, and will appear above the pie chart in the final display.

Next ask for the number of categories which must be a maximum of seven. Now ask for the units. This is the name of whatever units each category is measured in, for example people or days and can have up to six characters.

Finally you are asked for the name and number in each category. The name may contain up to nine characters. The screen is then cleared and the pie chart is drawn. Note that the figures in the % column will not always add up to 100, due to rounding.

Pie Chart
By Simon Lane

```
 10 PRINT TAB 10,"PIE CHART"
 20 PRINT TAB 10,
 30 PRINT "WHAT IS THE TITLE"
 40 INPUT T$
 50 PRINT ,T$
 60 IF LEN T$<=20 THEN GOTO 100
 70 CLS
 80 PRINT "SORRY, 20 CHARACTERS MAX"
 90 GOTO 30
100 PRINT ,,"HOW MANY CATEGORIES?"
110 INPUT N
120 PRINT ,,N
130 IF N<=7 THEN GOTO 170
140 CLS
150 PRINT "SORRY, 7 CATEGORIES MAX"
160 GOTO 100
170 DIM N(N)
180 DIM P(N)
190 PRINT ,,"WHAT ARE THE UNITS"
200 INPUT U$
210 CLS
220 IF LEN U$<=6 THEN GOTO 250
230 PRINT "SORRY 6 CHARACTERS MAX"
240 GOTO 190
250 DIM N$(N,9)
260 PRINT "CAT","NAME","NO OF U$"
270 PRINT "___","____","____
( TO LEN U$)
280 PRINT
290 LET T=0
300 FOR I=1 TO N
310 PRINT AT I*2,0,CHR$ (I+165)
320 PRINT AT I*2,5 "?"
330 INPUT X$
340 IF LEN X$<=9 THEN GOTO 430
350 FOR J=1 TO 5
360 PRINT AT 21,0,"*** SORRY, 9 CHARACTERS MAX ***"
370 FOR K=1 TO 20
380 NEXT K
390 PRINT AT 21,0,
400 FOR K=1 TO 10
410 NEXT K
420 NEXT J
425 GOTO 320
430 LET N$(I)=X$
440 PRINT AT I*2,5,N$(I),"?"
450 INPUT N(I)
460 LET T=T+N(I)
470 PRINT AT I*2,17,N(I)
480 NEXT I
490 FOR I=1 TO N
500 LET P(I)=N(I)/T*100
505 NEXT I
510 CLS
520 PRINT TAB 10-LEN T$/2,T$ TAB 26,"KEY"
530 PRINT AT 10,23,U$ TAB 30,"P"
540 FOR A=0 TO PI*2 STEP 1/20
550 PLOT 20+SIN A*20,20+COS A*20
560 NEXT A
562 FOR Y=20 TO 40
564 PLOT 20,Y
566 NEXT Y
570 LET D=0
580 FOR I=1 TO N
590 LET X$=CHR$ (I+165)
600 PRINT AT I*2,21,X$;" ";N$(I)
610 PRINT AT I*2+11,21,X$;" ";N(I) TAB 30 INT (P(I)+.5)
620 LET E=D+P(I)
630 IF I=N THEN GOTO 700
640 LET X=SIN (E/50*PI)*20
650 LET Y=COS (E/50*PI)*20
660 LET Z=ABS X
665 IF ABS Y>Z THEN LET Z=ABS Y
670 FOR J=0 TO Z
680 PLOT X/Z*J+20,Y/Z*J+20
690 NEXT J
700 PRINT AT 11-COS ((D+E)/100*PI)*8,10+SIN ((D+E)/100*PI)*8;X$
710 LET D=E
720 NEXT I
730 LET X$=STR$ T
740 PRINT AT I*2+11,23,"___"( TO LEN X$) TAB 23 X$,TAB 23 "_____"( TO LEN X$)
```

Arithmetic

on ZX81

Two programs for the 1KZX81 for your children to practice their sums. The first program is for eight- to 11-year-olds and will accommodate both addition or subtraction. The second program for younger children, is shown for addition only but can be easily adapted for subtraction, multiplication or division.

Both programs will just fit in 1K but only at the expense of total lack of comments in the listing and a primitive display. With 16K available much more can be done.

In the listing in figure 4, the difficulty can be adjusted to match the child by altering the values in lines 60 and 70. The 10 gives one decimal place and the 1000 gives values up to 99.9. The routine at line 500 ensures that the decimal points line up. The answer is checked at line 240 and allows for the slight imprecision in the ZX81 holding decimal numbers (when converted to binary etc).

In the listing in figure 3 the difficulty is dependent on the values in lines 50 and 60. Lines 60-100 select four values near to the right answer and ensure that no two values are alike. Lines 110-120 selects one out of the four as the correct answer. The choice is selected randomly between a b c d

Arithmetic
By Roy Eastwood

```
ADDITION OR SUBTRACTION

 10 LET R=0
 20 LET W=0
 30 PRINT "A OR S"
 40 INPUT X$
 50 CLS
 60 LET A=INT (RND*1000)/10
 70 LET B=INT (RND*1000)/10
 80 IF X$="A" THEN GOTO 130
 90 IF A>B THEN GOTO 130
100 LET D=A
110 LET A=B
120 LET B=D
130 LET Y$=STR$ A
140 GOSUB 500
150 LET Y$=STR$ B
160 GOSUB 500
170 IF X$="A" THEN PRINT "+"
180 IF X$="S" THEN PRINT "-"
190 PRINT "------"
200 LET S=A+B
210 IF X$="S" THEN LET S=A-B
220 LET Y$=STR$ S
230 GOSUB 500
232 INPUT Y$
234 PRINT AT 1,0;
236 GOSUB 500
240 IF ABS (VAL Y$-S)>.01 THEN GOTO 400
250 LET R=R+1
260 PRINT "R= ";R,"W= ";W
270 PAUSE 150
280 IF R>9 THEN STOP
300 GOTO 50
400 PRINT "WRONG"
410 LET W=W+1
412 PAUSE 150
415 CLS
420 GOTO 130
500 FOR N=1 TO LEN Y$
510 IF Y$(N)="." THEN GOTO 530
520 NEXT N
530 PRINT TAB 4-N,Y$
600 RETURN
```

```
ADDITION

 10 LET R=0
 20 LET W=0
 25 DIM B(4)
 30 PRINT "ENTER LETTER"
 40 PRINT
 50 LET A=1+INT (RND*11)
 60 LET B=1+INT (RND*11)
 70 PRINT A;"+";B;"=?"
 75 PRINT
 80 FOR N=1 TO 4
 90 LET B(N)=A+B-3+INT (RND*5)
 91 IF B(N)=A+B THEN GOTO 90
 92 FOR M=N-1 TO 1 STEP -1
 95 IF B(N)=B(M) THEN GOTO 90
 97 NEXT M
100 NEXT N
110 LET C=INT (RND*4)+1
120 LET B(C)=A+B
130 FOR N=1 TO 4
140 PRINT CHR$ (37+N),"  ";B(N)
150 NEXT N
160 INPUT U$
165 PRINT
170 PRINT U$
180 IF CODE U$-37<>C THEN GOTO 300
190 LET R=R+1
200 PRINT "R= ";R,"W= ";W
210 PAUSE 150
220 IF R>9 THEN GOTO 600
280 CLS
290 GOTO 30
300 PRINT "WRONG"
310 LET W=W+1
320 GOTO 150
600 PRINT AT 15,0;R;"/";R+W
```

```
ENTER LETTER

8+3=?

A 11
B 10
C 9
D 7


ENTER LETTER

6+4=?

A 10
B 19
C 9
D 11

A
R=0 W=1
```

Spectrum

In this new slot various contributors explore different aspects of the ZX Spectrum

Take a look inside the ZX Spectrum

***Staphan Adama** lifts the lid off the machine everyone's talking about*



What you get when you take the cover off the new ZX Spectrum

The ZX Spectrum is basically a more advanced version of the ZX81 with more RAM memory within the computer and the ability to have colour plus a limited sound capacity

There are 14 ICs in the case plus the familiar 1 amp, 5 volt voltage regulator The eight RAM ICs give a total of 16K using the same chips as used in the Sinclair 16K RAM pack (which is not usable on the Spectrum)

Also included is the transformer (on the top right) which provides −5v, +12v and −12v for the RAM chips and is still buzzing away

The two large chips on the right-hand side are the 16K ROM and the Z80A micro-processor

Moving to the left we come to two 74LS157 chips which are used when refreshing the RAM, the big chip to the left side of these is the Universal Logic Array (ULA) which contains all the electronic bits which control colour display, memory decoding and refreshing

Above the RAM chips is the colour encoding circuitry and its crystal, plus the crystal for the micro-processor which runs at 14Mhz The ULA however divides this down to 3 5Mhz before it gets to the Z80R

These crystals both have capacitor 'trimmers' which can be adjusted to keep the frequency correct and this makes the timing more accurate than the ZX81, which used a ceramic filter to control the frequency

On the far left-hand side below the video modulator (the metal box) is the PAL encoding IC which allows you to put colours on the TV picture

At the back are three sockets +9 volt power (a barrel socket on the review model we had, unlike the Jack Plug socket shown in the picture) MIC and EAR sockets

There is also the edge connector which now has 28 metal strips on both sides, unlike the ZX81 which only had 23 This means that only input/output ports 'may' work on the Spectrum

The memory map is entirely used up by the ROM and RAM and only the ROM CS line appears on the edge connector This means that any memory mapped devices will have to be redesigned

The edge connections are shown below and the ones that are different from the ZX81 are marked with an asterisk

Top of connecter	Bottom of connecter
1 A15*	A14*
2 A13*	A12*
3 D7	+5v
4 UNUSED	+9v
5 SLOT	
6 D0	0v
7 D1	0v
8 D2	CK
9 D6	A0
10 D5	A1
11 D3	A2
12 D4	A3
13 INT	IORQGE*
14 NMI	0v*
15 HALT	VIDEO
16 MREQ	Y*
17 IORQ	V*
18 RD	U*
19 WR	BUSREQ*
20 −5v*	RESET*
21 WAIT	A7
22 +12v*	A6
23 −12v*	A5
24 M1	A4
25 REFSH	ROM CS
26 A8*	BUSACK*
27 A10*	A9*
28 UNUSED	A11*

The keyboard plugs into two sockets as before so that other keyboards fitted to the ZX81 should work The only other sockets left on the board are two empty IC sockets to allow the 32K internal RAM board to plug into the Spectrum

The left-hand side socket contains the address lines and the right-hand one the data and control lines This extra board will convert a 16K Spectrum into a 32K one and costs £60

I was unable to test the tape interface or explore the IN and OUT commands as the review model overheated after half an hour and so no program of any length could be put in However, I have since heard of several Spectrums performing quite happily for longer periods, so it would appear we had a bad machine

The signs of overheating were colours mixing together on the screen, corruption of the program in RAM, plus the system going back to showing the copyright line (this usually appears on starting up the machine)

The IN and OUT commands are a very useful way of getting information via Basic out to an external device, but although there are said by Sinclair's manual to be 64K of them, less than 256 are available to the programmer

Conclusions

The ZX Spectrum will prove an interesting challenge to the manufacturers who are at the moment supplying products for the ZX81

For the user it means that again Sinclair has imposed a great deal of restrictions on what hardware can be used with the machine

Keys which unlock the most potential

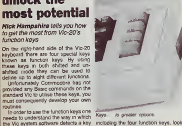
***Nick Hampshire** tells you how to get the most from Vic-20's function keys*

On the right-hand side of the Vic-20 keyboard there are four special keys known as function keys By using these keys in both shifted and unshifted mode they can be used to define up to eight different functions

Unfortunately Commodore has not provided any Basic commands on the standard Vic to utilise these keys, you must consequently develop your own routines

In order to use the function keys one needs to understand the way in which the Vic system software detects a key depression The Vic does this with a keyboard scanning routine which is called 60 times per second by an interrupt generated by one of the internal timers on the I/O chips

The keyboard scanning routine is very simple and scans all the keys, including the four function keys, looking for a key which has been pressed The keyboard is organised as an 8x8 matrix with the keys at the intersection points of the vertical and horizontal lines



Keys … to greater options.

The vertical lines are connected to an eight-line output port and the horizontal lines to an eight-line input port If a key is pressed then an output line is connected to an input line with just one combination of input/output line for every key

To scan the keyboard the computer sets just one of the output lines at a time low, while keeping the rest high, then tests the input port to see if any of the input lines are low This is repeated eight times for each output line

If one of the input lines is found to be low then a key depression is detected and the keyboard scanning software determines which key was pressed

This key is first assigned a number which is stored in location 203 prior to being decoded by the input routine and given an Ascii code value

When dealing with the function keys we are interested in the value stored in location 203, we are also interested in the status of the shift key, this is stored in location 583

```
1 REM *ROUTINE TO TE T [illegible]
2 REM *KEY HA[illegible] BEEN PRE[illegible]ED
3 REM
4 REM
5 REM *WHICH KEY PRE[illegible]ED
9 REM
10 A=PEEK(203)
11 REM
12 REM *SHIFT KEY [illegible]
13 REM
15 B=PEEK(653)
16 REM
17 REM *DECODE KEY NUMBER
18 REM
20 K=0
25 IF A=39 THEN K=1 [illegible]
30 IF A=47 THEN K=3 [illegible]
35 IF A=55 THEN K=5 [illegible]
40 IF A=63 THEN K=7 [illegible]
45 GOTO 10
70 IF B>1 THEN B=0
75 K=K+B
80 PRINT "FUNCTION KEY [illegible] PRESSED"
85 GOTO 10
```

Learning the values

By looking at the contents of location 203 we find that the function keys have been assigned the following values remember that the value in 203 for the shifted and unshifted key will be the same

function key #1 & #2 — 39
function key #3 & #4 — 47
function key #5 & #6 — 55
function key #7 & #8 — 63

The shift key in location 653 has the following status

shift unpressed — 0
shift pressed — 1
CBM pressed — 2
CBM and shift pressed — 3

The routine (*left*), uses these values to test which function key has been pressed It should be noted that although the Vic is only designed to have eight function keys this could be increased to 12 or even 16 by using the CMB and CBM shift keys in addition to pressing one of the four function keys

This would mean that each function key could have up to four different assignments depending on whether the shift CBM or both were also pressed



Giving soul to electronic music

Microcomputer-based musical instruments are appearing all over the place these days In the music charts, a number of performers use them as an integral part of their sound Others have their sound based on micro generated music

Depeche Mode is one group who use fast sequences to provide a backdrop for their imaginative new pop

At the other end of the spectrum are big international stars like Vangelis who provided the theme music for the film *Chariots Of Fire* and the Frenchman Jean Michel Jarre whose *China Concerts* were recently shown on television

Critics say that this kind of electronic music has no soul that anything based on the output of a microcomputer has not got expression This is of course denied by the music the performers produce

Most professional electro-musicians have very expensive equipment which enables them to express musical ideas fully It is possible to use some of their techniques at home, to produce more interesting computer music

There are a number of qualities that go to make up what we refer to as music Harmony, rhythm and timbre are the main ones

The timbre of a sound is closely related to its volume envelope On a synthesiser there is often a set of controls referred to as envelope It can be used to control the amplitude of the complete sound being triggered by the initial depression of a key

In a similar way it can be used to control the amount of filtering given to the sounds present at the output of the mixer

Of course some synthesisers allow you to control both the volume and the filtering with the envelope although only the most expensive machines allow you to define separate envelopes for each

The Roland SH-09 synthesiser even allows you to define the pulse width with the envelope enabling interesting phased effects

The timbre of a sound is the shape of the wave of a sound This wave is the one that defines the pitch of the sound and it has a shape that contains other frequencies giving it a distinct sound

Sequencer Jean Michel Jarre

For example a simple square wave sounds a little like a woodwind instrument a sawtooth wave like brass instruments

On a sophisticated machine the timbre envelope can be defined just like the others Thus an envelope varies a quantity over a time

Here is the short outline of a program that defines a volume envelope on the Vic-20

```
10 dim a(10)
20 FOR I=1 TO 10 INPUT a(I) NEXT I
30 POKE 36874 221 REM TEST NOTE
40 FOR I=1 TO 10 POKE 36878 a(I) FOR J=1 TO
   25 NEXT J NEXT I
50 POKE 36878 0
```

This program should give you an idea. If you think you can improve on it send your program (Vic, Atom BBC or Sinclair) to me Sam Blyth, care of *Popular Computing Weekly* The best submission will win a record album token

Sam Blyth



Seeing red when the word is blue

So far we've learnt that it is possible to draw not just a circle — or at least a polygon approximating one — but also how to use that graphic information to do other things This week, we'll take a look at something that is often neglected — the graphic use of text

The reason this is seldom referred to is not hard to pinpoint most computers just can't do it. Most machines only allow you a certain number of places to put text

Two exceptions are the Research Machines 380Z (so long as you use their level 2 graphics version of Basic called Basic SG2) and the BBC machine Doubtless there are others, doubtless you will write to tell me so

Though you can't easily alter the size of text on the BBC machine you can alter position and colour For example you can print the word RED in blue somewhere on the left of the screen, and the word GREEN, in yellow somewhere near the top

(Incidentally adults and children differ markedly in their ability to sense quite what is wrong about such a display)

One of the BBC Basic's VDU commands VDU5 links the text and graphics 'cursors' or conceptual pencils which are normally quite separate You don't usually want your questions to a graphics user appearing next to or even on top of the image

Here however, we'll make a virtue of that When you want to stop, VDU4 returns things to normality

First of all get into mode 5 graphics, which gives four colours and 160×256 points (though remember you always address them as if you had a thousand — the machine scales them down for you) Then type VDU5

Now, use the move command, with an X and a Y value (500 500 would be near the centre) to move the graphics (and hence the next) cursor to that point Then just print something like 'hello — it will appear at the current position (exactly) and in the current graphics colour (which you can change using the GCOL command)

You'll probably have seen the point already it is that you can by this method, cause text to be placed all over the screen The position of the text is determined by the graphics cursor So any program that generates images can instead (or as well) be used to place text

Remember that if the text is plotted very close to the last lot you may just get a blurred blocky effect (maybe you wanted that — it's called a creative mistake)

Try this with the circle program from last week, missing out all the plot commands except move and just printing something If you can find routines that will produce sine curves or lissajous figures, try linking the text to them

Then you could link in the sound as well so that the frequency of the note was determined by the vertical position of the graphics cursor on the screen

And so on **Brian Reffin Smith**

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Hand & mouth



Sharp's mini goes for the wallet

Sharp, the Japanese based calculator firm, has just launched what must be the most advanced mini calculator/computer on the market

Equipped with the new printer/cassette interface the mini-computer comes in a brown briefcase sized wallet which would not even fit into a Texan s pocket The PC 1500 supersedes and at first glance looks identical to the PC 1211

The total amount of random access memory has been increased to 3 5K (as opposed to the 1211 s 1 9K) with 1850 bytes available in Basic program and data memory

The RAM can be expanded by the addition of a 4K or 8K CMOS memory module, and programs stored on up to two cassette tape recorders simultaneously

Lest you obtain the false impression that this is just a PC 1211 Mark Two let me point out the significant differences

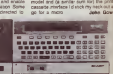
The now standard Sharp QWERTY keyboard has six very useful user defin able keys which can be operated as anything from reservable function and command keys to the control of games on the display The latter is possible on the 7 × 156 dot liquid crystal display since each dot is individually addressable leading to Sharp s advertising of a multi-graphic display area

There are a host of new Basic commands available to the user which especially improve string handling and enable two dimensional array manipulation Some of the new commands are directed towards the CE 150 printer which gives the best output I ve seen from a pocket model

The secret lies in a really quite advanced four colour graphic package which enables the user to chose nine different sizes of characters and lines ranging from four to 36 digits in length

Virtually any pattern may be displayed on the 58mm wide paper as the printing head can be controlled completely in all four directions

Of course there s always a hitch somewhere In this case it is the price which though probably justifiable takes the machine into the range of the microcomputer At around £150 for the basic model and (a similar sum for) the printer cassette interface I d stick my neck out and go for a micro **John Gowrie**



Sharp s PC1500 pocket computer with printer and printer cassette interface



Just remember... you are human!

Last week s questions should help you to examine assembler programs more critically and in this week s article I describe some more points to watch out for Remember you are unlikely to need all the features that could be included

Asimov the word processor I use to write with is over seven kilobytes of machine code assembled from more than 3 500 lines of source code The assembler I used is quite simple and I didn t use all of its facilities in the seven months it took to construct Asimov

Let me repeat one key idea from last week — the human factors in the engineering of the assembler are crucially important You will spend a great deal of time typing source code and editing extending and correcting after the first trial assembly

How easy are the controls to move the screen window over the source code held in memory? Ideally you should be able to use one single keystroke to move down the listing and another to move up

Can you alter the number of lines that you move in one bound for example?

Can you insert letters and words into a line of text or must you type the line again to alter it?

You will be able to delete one line of the program but can you also delete a block of lines and is the method for doing that easy to remember and carry out?

Is it possible to copy one or more lines from one part of the program to another? This facility is the basis of a macro-assembler and I will write more about that later

Will the assembler cope with different number bases that is, can you enter numbers in decimal hexadecimal and octal notation? The first two bases are the most important for microcomputers now current in this country

To which base does the assembler default? If you are familiar with hexadecimal for addressing Random Access Memory (RAM) then you will find decimal very strange and vice versa

Some assembler programs allow you to write a mathematical expression in place of the operand, that is the address or label following the CPU instruction The Microtanic Software assembler allows you to add or subtract while ZEN offers addition subtraction multiplication division and logical AND and OR

How easy is it to define bytes and words that you wish to use as constant numbers and variables in your program? For example the Microtanic Software assembler for the Tangerine uses the following pseudo op codes (that is an instruction that is recognised by the assembler but which is not in the CPU instruction set) among others

BYT — Defines a single byte value in memory eg 20 Hex which equals a space on the VDU

WOR — Defines a two byte value eg FC00 Hex the start of the TANBUG monitor

EQU — This instruction assigns a value to a label For example the instruction

```
PRINT EQU $A794
```

followed in the course of the program by the instruction

```
JSR PRINT
```

would cause the assembler to generate machine code that will jump to a sub routine at the address A794 Hex

John Dawson

Peek & poke

Peek your problems to our address. Ian Beardamore will poke back an answer

AND A BIG, BIG HAND FOR THE WINNER!

Malcolm Fraser of Stone Lane Kinver writes

Q I have a BBC Model A Microcomputer and have written a number of games in which the computer plays against me. What irks though is having to accept such low-key salutes as YOU WON CONGRATULATIONS!" which I find a let-down at the end of a long game. Could you suggest a way, or ways, of ending the program more dramatically, please?

A If you add the following routine, or some variation, to the end of your program, it will print an endless series of the word Congratulations!" in double height randomly coloured letters, at random positions on the screen while at the same time making an extraordinary cacophonous noise.

```
10 REM•END OF GAME DEMO•
20 MODE 7
30 REPEAT
40 A=RND(16):B=RND(16)
50 PRINTTAB(A,B)CHR$(141)
   CHR$(128+RND(8))
   "Congratulations!"
60 PRINTTAB(A,B+1)CHR$(141)
   CHR$(128+RND(8))
   "Congratulations!"
70 SOUND RND(4),-1 -15,
   RND(128)+127,RND(20)
80 UNTIL FALSE
```

HOW DO I POKE THE COLOUR ON MY VIC?

Kenneth Toomey of Milton Court London EC2 writes

Q I have only had my Vic-20 for a couple of weeks and have had great difficulty understanding the information given in the manual on how to put colour where I want it on the screen. I learnt about peek and poke at school using a ZX81 but what I've found out there doesn't seem of any use whatsoever for getting colour on to the screen. I would be pleased if you could indicate how the whole thing works, as I believe PEEK and POKE are much better ways of manipulating the screen than just using PRINT statements.

A The simplest way to poke colour into the screen — keeping in mind that you must poke a character into the screen using one set of addresses and then poke the colour for that character into place with what appears to be a completely different set of addresses — is to realise that there is a clear mathematical relationship between the two addresses. As you can tell from the charts in the back of your manual, the first screen address is 7680, for poking characters while the first screen address for colour is 38400, ie 30720 more.

I suggest you work out your program just using the character codes, and once that is working satisfactorily without colour, add the colour POKE commands working them out by adding 30720. Another way of doing this is to put both controls within a loop.

Enter and run the following routine which comes from the book *Symphony For A Melancholy Computer* and you'll see the process at work.

```
10 FOR Q=8032 TO 8119
20 POKE Q,160
30 POKE Q+38752-8032, 5
40 NEXT Q
```

MEMORIES ARE MADE OF THIS, PART ONE

Malcolm Arnott of Jedburgh Drive, Warrington writes

Q I have read from time to time of apparent problems that people have had with 16K packs on their ZX81s. Have these been solved or is there a recurrent problem with the RAM pack? I need to know before I spend £49.95 — which I can barely afford — on a Sinclair memory pack.

A The Sinclair 16K pack has, it is true, had pretty bad press in the past due to its habit of — in many cases — dumping everything so you lose the program, appearing to 'shrink' so variables are overwritten, or even actually falling off the back of the ZX81 while you are attempting to program.

Most of these problems can be overcome by removing the back of the RAM pack so it stays cool, cleaning the contacts with surgical spirit before you attach the memory, and using Blu-tack or a similar product to firmly fix the pack in place.

If you are not willing to go to these lengths — and there are many owners of 16K RAM packs bought from Sinclair who have not had to do such things — you could buy a memory expansion kit from someone else. First ask yourself how much memory you really need. Quicksilva, among others, supply a very cheap — around £15 — 3K pack which makes the computer much more useful than it is with just the 1K.

If you need more, you could choose from a number of reputable suppliers which include Phoenix Marketing (£34.95 for 16K), JRS Software (£35) and dK'Tronics (16K kit — £32.95, 4K — £22.95, 2K — £15.95).

MEMORIES ARE MADE OF THIS, PART TWO

Geoff Ross of Highlands Way, London NW7 writes

Q Why are REM statements used in programs at the start, when they don't do anything?

A A REM statement at the start of a program is usually used as storage space for a machine code routine. Because the computer ignores REM statements, it effectively starts the program at the first conventional statement. Information in the REM statement can then be accessed later. REM statements are usually put at the start of a program because there is nowhere for them to move within the RAM. The space they create is therefore always in the same place, which of course makes it much easier to use.

PRINT 'THIS IS THE WRITE ADDRESS'

David Hole of The Dell, Ashford, Kent writes

Q I want to send back my printer because I think it is faulty, but though Sinclair Research is based in Cambridge they have another address in Camberley, Surrey. To which address should I send my printer?

A The address you want is Sinclair Research (JRS) Stanhope Road, Camberley, Surrey, GU15 3PS. This is the address of Sinclair's mailing company which deals with all dispatch and returns. In fact I gave out this address a couple of weeks ago, so you might well know it by now.

A BIGGER APPETITE MEANS BIGGER BYTES

Kathy Stewart of Hill End Lane, Windsor writes

Q Is it true that a program on the ZX81 uses a great many more bytes than the same program on the ZX80?

A In many cases yes. The program below will use more than twice the number of bytes on the ZX81 than on the ZX80. Even with careful programming it is virtually impossible not to use more bytes on the ZX81.

```
10 LET A=5
20 DIM B (8)
30 LET C=RND(12)
          on the ZX81 enter
30 LET C=INT(RND*12)+1
```

HERE'S A BUNCH OF ODD CHARACTERS

Barry Keats of Arbour Lane, Harlow, Essex writes.

Q Is there a program that shows you the set of characters which the ZX81 has? I get fed up looking through books to find the list of them.

A Try the following

```
10 LET A=PEEK 16000
20 PRINT "INPUT CHARACTER NUMBER"
30 INPUT C
40 PRINT CHR$ C
```

This does what you want it to do, but there is a lot more scope if you add the following

```
40 PRINT CHR$ C;" — ";C
50 LET C=C+1
60 INPUT B$
70 IF B$="S" THEN STOP
80 IF B$="N" THEN GOTO 30
90 IF B$="R" THEN GOTO 40
```

'S' will simply STOP the program, 'N' lets you put in any new number, 'R' will PRINT out the next symbol and number after the one you have just entered.

Send your questions to Peek & poke, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF

Competitions

Puzzle No 6

An inch multiplied by an inch is a square inch. In the following cryptarithm however if digits are substituted for letters then the square of INCH also ends with the same four digits. What is the value of INCH?

```
        I N C H
        I N C H
      * * * * *
    * * * * *
  * * * * *
* * * * *
---------------
* * * * I N C H
```

Solution to Puzzle No 2

Place the sequence of numbers shown on the dial in a string (A $)

```
10 LET A $ = 98715463280871540826
20 FOR S = 1 TO 10
30 LET N $ = A $ (S)
40 LET M $ = A $ (S + 1 TO S + 4)
50 LET P $ = A $ (S + 5 TO S + 9)
60 GOSUB 200
70 LET N $ = A $ (S TO S + 3)
80 LET M $ = A $ (S + 4)
90 GOSUB 200
100 LET N $ = A $ (S TO S + 1)
110 LET M $ + A $ (S - 2 TO S + 4)
120 GOSUB 200
130 LET N $ = A $ (S TO S + 2)
140 LET M $   A $ (S + 3 TO S + 4)
150 GOSUB 200
160 NEXT S
170 STOP
200 IF VAL N $ * VAL M $ = VAL P $ THEN PRINT N
    $ * M $ = P $
```

As the sequence can be said to be Cyclical it has been repeated in the string so that given any starting point, as defined by line 20 FOR S = 1 TO 10 the next sequence of ten digits can be considered.

In this sequence of ten digits the product obtained must account for five of the ten so the remaining two numbers must be formed from either one digit plus four digits, or from two plus three. The two smaller numbers could appear in either order in the sequence, hence the extra lines 70 and 80, and 130 and 140.

Winner of Puzzle No 2

The winner is George Thomas, Alexandra Road, Brecon, Powys, Wales, who gets £10

Solution to Crossword No 2

Across 8 Car 9 Registers 10 Exponent 11 Pair 13 Nailed 14 Patent 17 Rack 18 Figuring 20 Aluminium 21 Ail

Down 1 Screen 2 Cryptic clue 3 Granted 4 Agent 5 Uses 6 Hexadecimal 7 Tear 12 Vacuums 15 Toggle 16 Sit in 17 Reed 18 Sin

Winner of Crossword No 2

The winner is Mrs M J Budden, Coleridge Gardens, Burnham-on-Sea, Somerset, who receives £10

Rules

Readers can enter any or all of our competitions but please use a separate envelope for each as this helps our judges.

The winner for the crossword and the winner of the puzzle will be the first name out of the hat (in each case).

Closing date for both the crossword and the puzzle is the Monday three weeks after the cover date.

Please mark your envelope CROSSWORD or PUZZLE

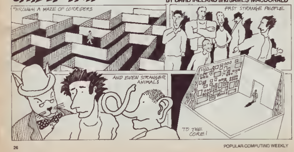
Crossword No 6

ACROSS

8 Cry from the Sahara Desert (3)
9 See 16D
10 It rusted away and a pile of waste (8)
11 When closed can't stop but it comes back wet (4)
13 Capital return in my computer store (6)
14 20A, a number of endrasters (8)
17 16D 9A Branch has acquired a ring (4)
18 Goes brown in 16D 9A and runs straight under the wheel (8)
20 Dark 16D 9A gives size (9)
21 Girl of 4D in 16D 9A (3)

DOWN

1 Research in development in 16D 9A and in 13A (6)
2 Stirring stew with items may keep me waiting (5 2 4)
3 8's love rising over railway doorman (7)
4 Price of prize (5)
5 Man of 14A in 16D 9A (3)
6 Sends penis name even fog swirls wheel (3 2,6)
7 Period for the seal 16D 9A (4)
12 Chemical swirls refers to a man (7)
15 He holds strange lust for frantic activity (6)
16 & 9A Personal computer find for degrees chips, an art gallery and man true?
17 The gallery contains superhuman beings (4)
18 In truth, in 16D 9A shop (3)







"Give me one good reason why I should choose a VIC 20 home computer."

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23. National dealer network providing full service and support to VIC owners.

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